

Appl. No. 10/672,416
Amdt. dated May 23, 2006
Reply to Office action of January 23, 2006

Docket No. 03RSC004

Remarks:

Claim Rejections - 35 USC §102

Claims 10-13, 17-19, 24, 26-28 and 30-32 were rejected under 35 U.S.C. 102(b) as being anticipated by Merricks et al. (U.S. Patent Application Publication 2002/0090484). All of these rejections based on the Merricks patent relate to features and elements of the invention that were disclosed in the parent of the present application (as amended), whose filing date predates that of the Merricks application. These rejections should therefore be removed.

Nonetheless, the applicants respectfully offer the following rebuttal to the examiner's statements (in the OA "Response to Arguments" section): "Furthermore, the applicant opines that Merricks et al. do not describe how bottom-up fill could be accomplished using the electroplating solution. The examiner respectfully disagrees. Merricks et al. teach electroplating on the seed layer to remove or repair the discontinuities. This process is the same as the bottom-up fill process." This last statement is incorrect. As the applicants explained in detail in the specification (Figure 3 and page 16, lines 17-27, and Figure 4 and lines 3-6), an accelerating additive species is essential to bottom-up filling of fine Damascene features. Note that larger features can be filled using a decelerating additive species, as described in the parent patent to Tench et al. In the absence of an accelerating additive, the deposit within fine Damascene features is conformal, which results in a void in the deposit at the center of the feature, as indicated in Figure 4 of the present specification. The need for an accelerating additive species to provide bottom-up fill of Damascene features is widely recognized by those skilled in the art (for example, see D. Josell, D. Wheeler and T. P. Moffat, *Electrochem. & Solid-State Letters* 5(4), C49 (2002)).

The applicants were the first to discover that copper deposition acceleration sufficient for bottom-up filling of fine Damascene features can be provided by using a small concentration of the DMTD additive for which the monomer accelerating species is dominant. Note that the parent patent specifies a decelerating additive concentration. The invention of the present application is an improvement of that of the parent patent.

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Claim Rejections - 35 USC §103

Claim 15 was rejected under 35 USC 103(a) as being unpatentable over Merricks et al. in view of Shipley et al.; Claims 14 and 29 were rejected under 35 USC 103(a) as being unpatentable over Merricks et al. in view of Jonker et al.; Claims 20 and 33 were rejected under 35 USC 103(a) as being unpatentable over Merricks et al. in view of Wells et al.; and Claim 25 was rejected under 35 USC 103(a) as being unpatentable over Merricks et al. in view of Wells et al. and Jonker et al. All of these rejections are based on the Merricks patent and relate to features and elements of the invention that were disclosed in the parent of the present application (as amended), whose filing date predates that of the Merricks application. In addition, all of these rejected claims are dependent claims, adding further restrictions on other dependent claims, and should be allowed if the dependent claims on which they depend are allowed. Therefore, all of the 35 USC 103(a) rejections should be removed.

Conclusion

The present application now claims priority, by amendment and petition, to a parent patent whose filing date predates that of the Merricks reference upon which all of the examiner's rejections are based. In addition, the arguments presented here show that the present inventors were the first to recognize that a copper pyrophosphate plating bath having a low concentration of the DMTD additive, which accelerates the copper electrodeposition rate, could provide bottom-up filling of fine Damascene trenches and vias.

In consideration of the arguments presented and the claim amendments made (previously), it is respectfully requested that all of the remaining claims, as amended, be allowed.

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Petition To Extend Time Period For Reply:

Applicants hereby petition, under 37 C.F.R. §1.136(a), to extend the time period for reply to the office action by one month, to May 23, 2006. The transmittal letter submitted with this response authorizes charging the petition fee of \$120 under 37 C.F.R. §1.17(a)(1) to Deposit Account No. 18-1750.

Petition To Claim Priority To Us 6,709,564:

Applicants hereby petition to claim priority to U.S. Patent 6,709,564 to Tench et al., which was filed on 30 September 1999 and issued on 23 March 2004. The present application, which was filed on 26 September 2003, was co-pending with this prior application. The entire delay between the date the priority claim was due until the date the claim was filed (i.e. the date this amendment was filed) was unintentional. The appropriate fee is included, and the application is amended herein to include a reference to U.S. Patent 6,709,564.

Authorization To Charge Deposit Account:

If an authorization to charge fees in this application to a deposit account is not already be on file, the undersigned hereby authorizes the Director to charge any fees which may be required, or credit any overpayment, to deposit account 18-1750.

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to:
Commissioner for Patents, P.O. Box 1450,
Alexandria, VA 22313-1450 on the date shown below:

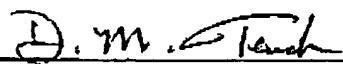
By: NATALIE RENNA

Signature

Dated: May 23, 2006

Very truly yours,

ROCKWELL SCIENTIFIC


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